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biomores division again depends on the nature, number, *and arrangement* of the biomolecules. In the biomonad, division is possible (1) because the biomores are mobile, being in liquid; (2) because they exercise a mutual attraction (shown by their union into masses giving parts of the cell their definite characters), and consequently assume a determinate arrangement. But division of the cell is completely independent of its structure, though the figures accompanying division, such as the spindle, the equatorial plate, etc., are dependent upon structure. The efficient cause of division is indeed always the same, whether in biomolecule or cell, namely, the mutual orientation of the parts; whatever the number, nature, or structure may be, division is inevitable when the proper arrangement is attained. Assimilation is indispensable to division, but not always sufficient. The discussion of cell division is elaborate and is illustrated by diagrams which make the presentation very clear and the process fascinatingly simple — would that it were so.

Such is a very brief outline of the hypothesis. Of course, it adds nothing to our knowledge, and it would be easy to revile it as an unstable pile of assumptions. But the real questions are, Does it take account of the present facts and coordinate them? Will it suggest fruitful research? That it takes account of all the facts is improbable; that it does fairly coordinate the more important ones (alas, too few) seems evident. That it will stimulate investigation remains to be seen. At any rate it deserves attention for what it purports to be, namely, an attempt to give a scientific interpretation of vital phenomena.— C. R. B.

MINOR NOTICES.

ONE OF THE latest of the series of Temple Primers is a little volume on *Plant life and structure* translated from the German of Dr. E. Dennert by Clara L. Skeat.[3] The author seems to recognize no organisms as plants but the seed plants, and continually makes assertions of the most comprehensive sort which are true only of green plants. Indeed he is rather given to generalizations, both regarding structure and function, and to teleology of the Paley type. In many minor matters and in some important ones the book is not up to the times; Goethean metamorphosis, sexual terms for the sporophyll and microspores, and much faulty physiology might have been more easily forgiven in a book dated a decade or two ago. But the best to be said of this booklet is that it is better than many more pretentious works and good enough for one to regret that it is not better.— C. R. B.

AMONG the plastic products of plants one of the groups most interesting chemically and most valuable commercially is the volatile oils. In their manufacture many firms have been engaged, but none so extensively, so exclusively, or more scientifically than Schimmel & Co., of Leipzig. Not content with much original work in the chemistry of these substances and costly experimentation with methods of manufacture, this firm commissioned Dr. E. Gildermeister, of Leipzig, and Dr. Fr. Hoffmann, of Berlin (the latter long and honored leader in pharmaceutical affairs in this country), to prepare a work on volatile oils,[4] treating them in an exhaustive and critical manner from the modern standpoint. This work, published about a year ago, has been translated into English by Dr. Edward Kremers, of the University of Wisconsin. The recent rapid development of the knowledge of the volatile oils makes the present volume doubly useful. With the chemistry of these bodies it happily combines much interesting historical matter and a description of the modern processes of distillation. Abundant references to original chemical sources make the work an important aid to the investigator.

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[3] DENNERT, E.: Plant life and structure. Translated from the German by Clara L. Skeat. 16 mo. pp. viii + 115, *figs. 56.* London: J. M. Dent & Co. (undated). New York: The Macmillan Company. 40 cents.

Though primarily chemical and technical, the list of plants, arranged according to families, from which volatile oils are obtained will be interesting for the botanist and the whole book is a mine of information. Four hundred and thirty oils are described, the botanical sources, percentage present in various parts, mode of preparation and composition being given.—C. R. B.

NOTES FOR STUDENTS.

HAROLD L. LYON, of the University of Minnesota, has announced[5] that Nelumbo, "both in its anatomy and embryogeny conforms to the type of the monocotyledons." His full paper will be awaited with interest.—J. M. C.

LEWIN[6] contradicts the view of Stahl that raphides are important as a means of protection against herbivorous animals. There is no evidence of mechanical injury to animals, nor of poisonous effects being produced through eating plants that contain these crystals.—H. C. COWLES.

MIYOSHI[7] has performed a number of experiments in order to determine the influence of various substances in the soil or water upon flower colors. His results are not uniform, though he finds in general that aluminium compounds change lilac to blue (as Molisch previously observed), while potash changes lilac to green, and many acids change it to red.—H. C. COWLES.

W. C. WORSDELL[8] has concluded that the Bennettitales are more primitive than the modern cycads, as shown by their stem structure, radial

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[4] GILDERMEISTER, E. and HOFFMANN, FR.: The volatile oils. Written under the auspices of the firm of Schimmel & Co., Leipzig. Authorized translation by EDWARD KREMERS. 8vo. pp. viii + 733, *figs. 83, maps 4.* Milwaukee: Pharmaceutical Review Pub. Co. 1900.

[5] Science **13**: 470. 1901.

[6] Ber. deut. bot. Gesell. **18**: 53–72. 1900.

[7] Bot. Centralbl. **83**: 345. 1900.

[8] The affinities of the mesozoic fossil *Bennettites Gibsonianus.* Ann. Bot. **14**: 717–721. 1900.